Attorney's Docket No. 015290-517

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	Confirmation No. 3359
Tuqiang Ni et al.	Group Art Unit: 1763
Application No.: 09/788,365	Examiner: RUDY ZERVIGON
Filed: February 21, 2001	Appeal No.: Unassigned
For: GAS INJECTION SYSTEM FOR PLASMA PROCESSING	

APPEAL BRIEF

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is from the decision of the Primary Examiner dated June 7, 2005, finally rejecting Claims 25 and 28-45. These claims are reproduced as the Claims Appendix of this brief.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800.

I. REAL PARTY IN INTEREST

The present application is assigned to Lam Research Corporation. The assignment is recorded at reel 9888/frame 0543.

II. RELATED APPEALS AND INTERFERENCES

The Appellants' legal representative, or assignee, does not know of any other appeal or Interference, which will affect, or be directly affected by, or have bearing on, the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 25 and 28-45 are pending in this application and are being appealed.

IV. STATUS OF AMENDMENTS

A Request for Reconsideration was filed on August 3, 2005, subsequent to the final Official Action. No Amendment was filed subsequent to the final Official Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claims 25 and 28-45 are directed to a gas injector for supplying process gas to a plasma processing chamber in which a semiconductor substrate is subjected to plasma processing. Claims 25, 39, 41 and 42 are independent claims.

The gas injector recited in independent Claim 25 comprises a gas injector body of dielectric material. The injector body is sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber. The gas injector body includes a plurality of gas outlets adapted to supply process gas into the processing chamber. The gas outlets are located in the axial distal end surface of the gas

injector body. The gas outlets are sized to inject the process gas at a subsonic, sonic or supersonic velocity.

An exemplary embodiment of the gas injector 22 is shown in Figures 1 and 3A. The gas injector 22 includes a body 40, which can be of dielectric material as recited in Claim 25. See page 10, lines 6-9, of the specification. The body 40 is sized to extend through a chamber wall, e.g., a dielectric window 20 of a processing chamber 10, such that the axial distal end surface (i.e., the bottom surface) of the gas injector body 40 is exposed within the processing chamber (Figure 1). The gas injector body 40 includes a plurality of gas outlets 46 adapted to supply process gas into the processing chamber. The gas outlets are located in the axial distal end surface of the gas injector body. See page 9, lines 1-22, and page 10, lines 22-26, of the specification.

The gas injector recited in independent Claim 39 comprises, *inter alia*, a gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber and a cylindrical bore adapted to supply gas to the gas outlets. The cylindrical bore is defined by a sidewall and an endwall that extends radially inwardly from the sidewall (i.e., toward the center of the bore). The gas outlets include a center gas outlet extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction. The gas outlets are located in the axial distal end surface of the gas injector body.

An exemplary embodiment of the gas injector 22 shown in Figure 3A includes a cylindrical bore 44 defined by a sidewall and an endwall. A marked-up copy of Figure 3A (Exhibit A), which was submitted with the Amendment filed on April 4,

2005, is attached. The figure shows the locations of the "sidewall" and "endwall" of the embodiment of the gas injector body. As shown, in the depicted vertical orientation of the gas injector 22, the sidewall is the axially-extending inner wall of the body 40, while the endwall is the inner wall defining the lower end of the cylindrical bore 44, and which extends radially inwardly from the sidewall. The cylindrical bore 44 supplies gas to a center gas outlet 46 and to a plurality of angled gas outlets 46, as also depicted in Figure 3C. As shown in Figure 3A, the gas outlets 46 extend from the endwall to the axial end surface (i.e., the bottom surface) of the body of the gas injector 22. The gas injector 22 also includes an annular flange 42 adapted to overlie and contact an outer surface of the chamber wall, as depicted in Figure 1.

The gas injector recited in independent Claim 41 comprises a gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber. The gas outlets are located in the axial distal end surface of the gas injector body. The gas injector body includes a uniform diameter central bore adapted to supply gas to the gas outlets. The central bore extends axially from an upper axial end face of the gas injector body. The central bore is defined by a cylindrical sidewall and a flat endwall, which extends between the cylindrical sidewall. Inlets of the gas outlets are located on the flat endwall.

In the embodiment of the gas injector 22 shown in Figure 3A, the central bore 44 has a uniform diameter, i.e., the diameter is constant along the entire length of the central bore. The uniform-diameter central bore 44 is defined by a cylindrical sidewall (i.e., the axially-extending inner wall of the body 40), and a flat endwall (i.e.,

the inner wall defining the lower end of the central bore 44) extending between the sidewall. As recited in Claim 41, the gas outlets are located on the flat endwall.

The gas injector recited in independent Claim 42 comprises a gas injector body made of a dielectric material selected from the group consisting of quartz, alumina and silicon nitride. The gas injector body includes a plurality of gas outlets adapted to supply process gas into the processing chamber. The gas outlets are located in the axial distal end surface of the gas injector body.

The claimed gas injector can be used to substantially uniformly etching various substrate materials using various process gases. See page 11, line 1 to page 12, line 10, of the specification. For example, Figure 4 graphically depicts a substantially uniform etch by-product distribution that was achieved across a wafer surface. Figure 5 depicts a substantially uniform chlorine atom distribution intensity achieved for a wafer. Figures 6a-6c show SEM images of etch profiles in polysilicon dense lines and Figures 6d-6f are SEM images of etch profiles in polysilicon isolated lines for different regions of a wafer. The SEM images show that the etch profile is substantially uniform across the wafer. Figures 7a-7d show additional exemplary etch results produced using the claimed gas injector.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1) Claims 25, 29, 33, 34, 37, 38, 42 and 45 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,685,942 to Ishii in view of U.S. Patent No. 5,772,771 to Li et al. ("Li") and U.S. Patent No. 6,132,512 to Horie et al. ("Horie").

2) Claims 28, 30-32, 35, 36, 39, 40, 43 and 44 stand rejected under 35 U.S.C. § 103(a) over Ishii and Li in view of U.S. Patent No. 6,077,357 to Rossman et al. ("Rossman") and Horie.

3) Claim 41 stands rejected under 35 U.S.C. § 103(a) over Ishii and Li in view of U.S. Patent No. 5,734,143 to Kawase et al. ("Kawase") and Horie.

VII. ARGUMENT

A. Legal Standards for Claim Construction

As stated in Phillips v. AWH Corp., No. 03-1269, -1286, slip op. at 9 (Fed. Cir. July 12, 2005) (en banc):

> We have frequently stated that the words of a claim 'are generally given their ordinary and customary meaning.' ... We have made clear, moreover, that the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application. (Citations omitted).

See also M.P.E.P. § 2111.01(II). As stated in Toro Co. v. White Consol. Indust. Inc., 53 USPQ2d 1065, 1067 (Fed. Cir. 1999), "[w]ords in patent claims are given their ordinary meaning in the usage of the field of the invention, unless the text of the patent makes clear that a word is used with a special meaning." See also M.P.E.P. § 2111.01(III).

B. Legal Standards for Obviousness

In order to establish *prima facie* obviousness of claimed subject matter, the U.S. Patent and Trademark Office ("PTO") has the burden to show (1) "some suggestion or motivation in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to ... combine the reference teachings"; (2) "a reasonable expectation of success"; and that (3) "the prior art ... references when combined ... must teach or suggest all the claim limitations." See M.P.E.P. § 2143 at page 2100-135.

"The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure" (citation omitted). Id. As stated in In re Lee, 61 USPQ2d, 1430, 1434 (Fed. Cir. 2002):

> It is improper, in determining whether a person of ordinary skill would have been led to use this combination of references, simply to [use] that which the inventor taught against its teacher. (Citation omitted).

Finding individual features of a claim selectively in the art does not establish *prima facie* obviousness; the art must also suggest the desirability of the proposed combination. Merely because art may be modified to result in claimed subject matter does not render the claimed subject matter obvious. In re Fritch, 23 USPQ2d 1780, 1783-84, n. 14 (Fed. Cir. 1992).

How the proposed modification of the base reference affects the ability of the base reference to achieve its intended purpose and the base reference's principle of operation are factors that must be considered in an obviousness determination. The Court of Appeals for the Federal Circuit addressed the issue of combined-reference

obviousness under 35 U.S.C. § 103 in In re Kotzab, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000), in which the court stated:

> [m]ost if not all inventions arise from a combination of old elements. Thus, every element of a claimed invention may often be found in the prior art. However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by applicant. (Citations omitted; emphasis added).

Where a proposed modification of a base reference would render the base reference unable to achieve its intended purpose, the references provide no suggestion or motivation to modify the base reference. In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984). See also, In re Sponnoble, 160 USPQ 237, 244 (CCPA 1969) (a combination of references that would produce a seemingly inoperative device teaches away from the proposed combination); Ex Parte Westphalen, 159 USPQ 507, 508 (Bd. App. 1967); Ex Parte Hartmann, 186 USPQ 366, 367 (Bd. App. 1974) (a combination of references that would destroy the device of the base reference for its intended purpose would not have rendered obvious the claimed subject matter); and In re Ratti, 123 USPQ 349, 352 (CCPA 1959) (a proposed combination of references that change in the basic principles under which the base reference construction was designed to operate is improper).

C. Rejection of Claims 25, 29, 33, 34, 37, 38, 42 and 45

The first ground of rejection of Claims 25, 29, 33, 34, 37, 38, 42 and 45 under 35 U.S.C. § 103(a) over Ishii in view of Li and Horie should be reversed for at least the following reasons.[1]

1. Claims 25, 29, 33, 34, 37 and 38

Claim 25, 29, 33, 34, 37 and 38 are separately patentable over the applied references for the following reasons.

(a) The Claimed Term "Dielectric Material" Has Not Been Properly Interpreted

Claim 25 recites a gas injector for supplying process gas to a plasma processing chamber, which comprises, *inter alia*, "gas injector body of dielectric material and sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber" (emphasis added).

Appellants submit that the Examiner has improperly construed the term "dielectric material" recited in Claim 25 (and also in Claim 42 discussed below). As discussed above, the PTO is required to give the term "dielectric material" its plain meaning as would be interpreted by one having ordinary skill in the field of semiconductor material plasma processing unless the application makes clear that

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[1] Claim 45 depends from Claim 28, which is not included in the group of claims subject to this ground of rejection. Claim 45 has not been rejected under any other ground of rejection set forth in the final Official Action. Accordingly, Claim 45 is assumed to be patentable.

this term has been given a special meaning. Toro Co., 53 USPQ2d at 1067. However, the term "dielectric material" has not been given a special meaning in the specification. As discussed at page 10, lines 7-8, of the specification, exemplary dielectric materials that can be used to make the gas injector include quartz, alumina and silicon nitride. One having ordinary skill in the art would understand that each of these dielectric materials is an electrical insulator.

As was discussed in the Amendment filed on April 4, 2005, dielectric materials are, along with conductor and semiconductor materials, one of the discrete classes of solid-state materials. Appellants submitted a dictionary definition of "dielectric" with the April 4, 2005, Amendment.[2] According to the dictionary definition, dielectric materials are non-conductors of electricity, i.e., electrical insulators. Appellants submit that one having ordinary skill in the art also would understand that conductor or semiconductor materials would have different electrical conductivity properties than the claimed "dielectric material."

(b) The Applied References Teach Away From a Gas Injector Having a Body of a Dielectric Material

The Examiner has acknowledged that Ishii does not disclose a gas injector body of dielectric material. The Examiner states, however, that "Ishii teaches alternative materials to conductive, non-dielectric, electrodes which are dielectric semiconductors such as the same materials as that of the processed semiconductor ('quartz') wafer (column 4; lines 43-51)." Ishii does not include any disclosure that

[2] The final Official Action states at page 9, numbered points (6) and (7), that an Affidavit under 37 C.F.R. 1.131 was filed on April 4, 2005. Appellants respectfully point out that no such affidavit was filed by Appellants.

supports these statements. Moreover, Appellants submit that these statements are inconsistent with the understanding that one having ordinary skill in the art would have regarding the meaning the terms "dielectric," "conductor" and "semiconductor."

Ishii's showerhead electrode 85 shown in Figure 4 is a ground electrode. In order to be able to provide this function, the ground electrode 85 must be made of a material that is electrically conductive. Because dielectric materials are electrical insulators, but not electrical conductors, the ground electrode 85 would be inoperable for its intended purpose of conducting electricity if it were modified to be made of an electrical insulator. For this reason, Ishii also provides no suggestion or motivation to modify the ground electrode in the manner proposed by the Examiner. See In re Gordon, 221 USPQ at 1127.

Appellants further note that Ishii discloses several reasons for locating a ground electrode that supplies process gas into the processing chamber (e.g., ground electrode 85) at the top of the plasma processing apparatus (Ishii at column 11, lines 6-21). This disclosure would have led one having ordinary skill in the art away from replacing the ground electrode 85 with a gas injector of a dielectric material.

Moreover, Ishii does not suggest that any insulator material would be suitable for making the ground electrode 85. At column 4, lines 43-51, Ishii discloses that the electrode is made of a conductor or a semiconductor, i.e., a conductive material. Ishii discloses that the ground electrode can be made of the same material as that of the processing housing 2, i.e., aluminum, which has a high electrical conductivity. Ishii also discloses that "Si single crystal, SiC or C, which are the same material as that of the semiconductor wafer, can also be used as a material to prevent heavy

metal contamination" (emphasis added). Consistent with the fact that dielectric materials have different electrical properties than conductors and semiconductors, Ishii does not suggest that the ground electrode can be made of a dielectric material.

Regarding the contention that Ishii teaches "electrodes which are dielectric semiconductors such as the same materials as that of the processed semiconductor ('quartz') wafer" (emphasis added), it is well-known in the art of semiconductor substrate plasma processing that quartz is an insulator material, but not a semiconductor material, which can be used to make parts that act as electrical insulators. In fact, at column 9, lines 44-46, Ishii discloses the following about quartz:

> A cylindrical support member **132** consisting of an insulating member such as ceramics or quartz, is disposed at the center of the bottom surface of the chamber **115**. (Emphasis added).

Thus, Ishii itself directly refutes the Examiner's position that quartz is a semiconductor material. Ishii does not support the Examiner's position that the conductive ground electrode could be made from a dielectric material.

At page 4, second paragraph, of the final Official Action, the Examiner states that it would have been obvious to "use alternative conductor materials for Ishii's conductor gas injector" (emphasis added). However, making Ishii's ground electrode from an alternative conductor material could not result in the claimed injector body of dielectric material.

At page 10, numbered point (9), of the final Official Action, the Examiner further states that:

> In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "Particularly, dielectric materials are electrical insulators, and semiconductor materials

> have electrical properties intermediate to those of insulators and conductors.") are not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims ... . To this end Applicant appears to indirectly argue ranges of a dielectric property, however, none of the pending claims require a claimed range of a dielectric property.

Appellants are not claiming any specific range of a dielectric property of the dielectric material in Claim 25. Appellants are also not urging that any limitation regarding the electrical properties of the dielectric material be read into Claim 25 from the specification. Rather, Appellants submit that the term "dielectric material" should be construed as it would be understood by one having ordinary skill in the art. It is well-known in the art that dielectric materials are electrical insulators, while semiconductor and conductor materials are discrete other classes of solid-state materials that have different electrical properties than those of dielectric materials. One having ordinary skill in the art would understand that the dielectric material recited in Claim 25 has different electrical properties than the conductor or semiconductor materials that Ishii discloses can be used to make the ground electrode 85, i.e., that such properties are already implicit in the language recited in Claim 25.

Moreover, the applied combination of references does not provide the necessary suggestion or motivation to modify Ishii's ground electrode 85 to produce the gas injector recited in Claim 25. Li discloses a deposition chamber 2 including a nozzle 56. See Figure 1 of Li. The Examiner references Figures 18A, 18B of Horie, which illustrate a gas injection head 60 including nozzle orifices 63 in a showerhead arrangement (final Official Action at page 4, lines 1-3). Appellants submit that Li and

Horie fail to cure the above-discussed deficiencies of Ishii with respect to the claimed gas injector.

Accordingly, because the modification of Ishii's ground electrode advanced in the final Official Action would make the ground electrode inoperable for its intended purpose in Ishii's apparatus, the combination of references does not suggest, but teaches away from, the proposed modification of Ishii. See In re Sponnoble, 160 USPQ at 244; Ex Parte Westphalen, 159 USPQ at 508 and Ex Parte Hartmann, 186 USPQ at 367. Thus, the gas injector recited in Claim 25 is patentable over the applied references. The gas injector recited in Claims 29, 33, 34, 37 and 38, which depend from Claim 25, is also patentable.

2. Claim 42

Independent Claim 42 is separately patentable over the applied combination of references. Claim 42 recites a gas injector for supplying process gas to a plasma processing chamber, which comprises, *inter alia*, "gas injector body made of a dielectric material selected from the group consisting of quartz, alumina and silicon nitride and sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber" (emphasis added).

For reasons discussed above, the applied combination of references does not provide the required suggestion or motivation to modify Ishii's ground electrode to make the electrode of a dielectric material. Thus, the applied combination of references does not suggest a gas injector comprising the combination of features

recited in Claim 42, including, *inter alia*, the features of "gas injector body made of a dielectric material selected from the group consisting of quartz, alumina and silicon nitride" (emphasis added). Thus, the gas injector recited in Claim 42 is patentable over the applied references.

D. Rejection of Claims 28, 30-32, 35, 36, 39, 40, 43 and 44

The second ground of rejection of Claims 28, 30-32, 35, 36, 39, 40, 43 and 44 under 35 U.S.C. § 103(a) over Ishii and Li in view of Rossman and Horie should be reversed for the following reasons.

1. Claims 28, 43 and 44

Claims 28, 43 and 44 are separately patentable over the applied combination of references. Claim 28 depends from Claim 25. Claims 43 and 44 depend from Claim 28.

Rossman has been cited for disclosure of O-ring seals (final Official Action at page 6, lines 1-4). Appellants submit that Rossman also provides no suggestion or motivation to make Ishii's electrode of a dielectric material. Accordingly, the gas injector recited in Claims 28, 43 and 44 is patentable over the combination of Ishii, Li, Horie and Rossman for this reason.

Moreover, Claims 28, 43 and 44 recite additional combinations of features that further patentably distinguish the claimed gas injector over the applied combination of references. Particularly, Claim 28 recites the features of "the gas outlets include a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction." In stark

contrast, Ishii's ground electrode 85 is a shower head gas injector in which each of the supply ports 87 extends along the axial direction of the ground electrode 85.

In stark contrast to Ishii's showerhead ground electrode 85 including axial, parallel supply ports 87, Li explicitly discloses that the nozzle 56 is not a showerhead type gas injector. That is, Li discloses that "the center nozzle 56 could be replaced by a shower head type of gas distributor having multiple exits" (emphasis added) (column 5, lines 31-33). Li discloses that the nozzle 56 and a shower head are different types of gas distributors that can be used in place of each other. Li does not suggest that the showerhead gas distributor could be modified to incorporate any aspects of the nozzle 56. Li does not suggest modifying Ishii's showerhead ground electrode 85 to incorporate any features of the nozzle 56, much less modifying Ishii's showerhead ground electrode 85 to result in the gas injector recited in Claim 28, which includes the features of "the gas outlets include a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction."

Furthermore, because each center nozzle 56a of Li's nozzle 56 extends at an angle relative to the axial direction of the nozzle, modifying Ishii's ground electrode 85 including axially extending supply ports 87 to include Li's supply ports all oriented at an angle relative to the axial direction of the ground electrode 85 would not result in the gas injector recited in Claim 28, which includes a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction.

For at least the foregoing reasons, the applied combination of references does not support the alleged *prima facie* obviousness with respect to Claims 28, 43 and 44, which are therefore patentable.

2. Claim 31

Claim 31 depends from Claim 25 and is separately patentable. Claim 31 recites the features of "the gas outlets include a plurality of angled gas outlets which inject process gas at an acute angle relative to a plane parallel to the distal end surface." For at least the following reasons, Appellants submit that the applied combination of references does not provide the required suggestion or motivation to modify Ishii's ground electrode 85 to result in the gas injector recited in Claim 31.

First, Rossman provides no suggestion or motivation to make Ishii's electrode of a dielectric material. Accordingly, the gas injector recited in Claim 31 is patentable over the combination of Ishii, Li, Horie and Rossman for this reason.

Second, as discussed above, Li provides no suggestion or motivation to modify Ishii's showerhead ground electrode to include any gas outlets that do not extend in the axial direction of the ground electrode 85, much less to include "gas outlets [which] include a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction," as recited in Claim 31.

Thus, the gas injector recited in Claim 31 is patentable over the applied combination of references.

3. Claims 30, 32, 35 and 36

Claims 30, 32, 35 and 36 are separately patentable. Claim 30 depends from Claim 29. Claims 32, 35 and 36 depend from Claim 25.

As discussed above, Rossman provides no suggestion or motivation to make Ishii's electrode of a dielectric material. Accordingly, the gas injector recited in Claims 30, 32, 35 and 36 is patentable over the combination of Ishii, Li, Horie and Rossman for at least this reason.

4. Claims 39 and 40

Claims 39 and 40 are separately patentable over the applied combination of references. Independent Claim 39 recites a gas injector for supplying process gas to a plasma processing chamber, which comprises, *inter alia*, "gas injector body ... including a plurality of gas outlets adapted to supply process gas into the processing chamber and a cylindrical bore adapted to supply gas to the gas outlets, the cylindrical bore being defined by a sidewall and an endwall which extends radially inwardly from the sidewall, the gas outlets including a center gas outlet extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction, wherein the gas outlets are located in the axial distal end surface of the gas injector body" (emphasis added).

As discussed above, Li does not suggest modifying Ishii's shower head ground electrode 85 to include any features of the nozzle 56, which is not a shower head type gas distributor. As such, the applied combination of references fails to suggest modifying Ishii's showerhead ground electrode 85 to include the features of a gas injector body including a plurality of gas outlets including "a center gas outlet

extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction" (emphasis added), as recited in Claim 39.

As also discussed above, each of the supply ports 87 of Ishii's showerhead ground electrode 85 extends axially, while none of Li's nozzles 56a extends along the axial direction of the nozzle 56. As such, Li provides no suggestion to modify Ishii's ground electrode 85 to include the combination of a center gas outlet extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction, as recited in Claim 39. Thus, the applied references do not provide the required motivation to modify Ishii's showerhead ground electrode 85 in the manner proposed by the Examiner. In the absence of any such suggestion or motivation in the references themselves, Appellants submit that the rejection improperly amounts to using that which the inventors taught against its teachers. In re Lee, 61 USPQ2d at 1434.

Thus, the gas injector recited in Claim 39 is also patentable. Claim 40, which depends from Claim 39, is also patentable.

E. Rejection of Claim 41

The rejection of Claim 41 under 35 U.S.C. § 103(a) over Ishii and Li, in view of Kawase and Horie should be reversed for at least the following reasons.

Claim 41 recites a gas injector for supplying process gas to a plasma processing chamber, which comprises, *inter alia*, "a gas injector body sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas

injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber, wherein the gas outlets are located in the axial distal end surface of the gas injector body ..., wherein the gas injector body includes a uniform diameter central bore adapted to supply gas to the gas outlets, the central bore extending axially from an upper axial end face of the gas injector body, the central bore being defined by a cylindrical sidewall and a flat endwall extending between the cylindrical sidewall, inlets of the gas outlets being located on the flat endwall" (emphasis added).

As discussed above, in the embodiment of the claimed gas injector 22 shown in Figure 3A, the endwall is the inner wall defining the lower end of the central bore 44, and the sidewall is the axially-extending inner wall of the injector body partially defining the central bore 44. In the gas injector 22, the endwall extends between the cylindrical sidewall, i.e., in the space between the sidewall. In the gas injector 22 shown in Figure 3A, the endwall spatially connects the sidewall. In the gas injector 22, inlets of the gas outlets 46 are located on the flat endwall. The outlets of the gas outlets 46 are located in the axial distal end surface of the gas injector body 22.

The Examiner contends that Ishii discloses a gas injector body 85 including "a uniform diameter central bore" 88a extending axially from "an upper axial end face (top surface 85)" of the gas injector body, with the central bore being defined by a cylindrical sidewall and "a flat endwall (bottom surface 85)" (final Official Action at page 7, lines 10-13). The Examiner acknowledges that Ishii and Li do not teach that the inlets of the "gas outlets 87" are located on the flat endwall (final Official Action at page 7, line 14). However, the final Official Action contends that Kawase discloses a gas injector ("dielectric plate" 11) shown in Figure 2 including a uniform diameter

central bore along axis 70 defined by a cylindrical sidewall and a flat endwall ("bottom of 11"), with inlets of the gas outlets 10 located on the flat endwall (final Official Action at paragraph bridging pages 7 and 8). The Examiner further contends that it would have been obvious to replace Ishii's injector body (ground electrode 85) with Kawase's injector body (final Official Action at page 8, lines 3-4). Appellants disagree with these statements.

Ishii's ground electrode 85 shown in Figure 4 includes a gas inlet 88a. The gas inlet 88a terminates at its bottom end at the inlet to the hollow portion 86. To the extent that the Examiner has contended that Ishii's gas inlet 88a is a "uniform diameter central bore," as recited in Claim 41, the gas inlet 88a is not defined by a cylindrical sidewall and a flat endwall extending between the cylindrical sidewall, and on which inlet of a plurality of gas outlets are located. At the least, Ishii's ground electrode 85 includes no such endwall that defines the gas inlet 88a and on which a plurality of gas outlets are located.

Furthermore, the "flat endwall" of Kawase's plate 11, i.e., the bottom of the dielectric plate 11, does not extend between the "cylindrical sidewall" defining the "central bore" of the plate 11. In contrast, in Kawase's plate 11, the space "between" the sidewall (i.e., the space that connects spatially the sidewall and in which the central gas inlet port 13 is located) is empty, and the bottom surface of the dielectric plate 11 extends radially outwardly from the bore extending along axis 70 to the side surface of the dielectric plate 11.

Also, Claim 41 recites the features of "the gas injector body includes a uniform diameter central bore adapted to supply gas to the gas outlets" (emphasis added). In the embodiment of the gas injector shown in Figure 3A, the central bore 44 is in

fluid communication with the gas outlets 46. In Kawase's plate 11, however, the bore extending along axis 70 cannot supply gas to the alleged outlets (gas injection holes 10) because the bore and gas injection holes are not in fluid communication with each other. As such, Kawase also does not suggest the features of a gas injector body including a uniform diameter central bore adapted to supply gas to the gas outlets, as recited in Claim 41.

Appellants also note that the inlets of Kawase's gas injection holes 10 are not located on the bottom surface of the plate 11. Rather, the outlets of the gas injection holes 10 are located on the bottom surface of the plate 11 so that the gas is injected along the injection axis 60 toward the axis 70 (column 6, lines 10-12). To the extent that the Examiner has contended that the inlets and the outlets of the gas injection holes 10 are located at the same surface of the plate 11, Kawase does not support such contention.

Thus, because Kawase's dielectric plate 11 does not include each and every feature of the gas injector body recited in Claim 41, replacing Ishii's ground electrode 85 with Kawase's dielectric plate 11 (1) would improperly destroy the operability of Ishii's ground electrode 85 (of an electrically conductive material) and (2) would not produce a gas injector including each and every feature recited in Claim 41. As stated at M.P.E.P. § 2143.03, page 2100-133, however, "[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art" (citation omitted). Thus, the gas injector recited in Claim 41 is patentable over the references.

VIII. CLAIMS APPENDIX

The attached Claims Appendix provides a copy of the claims involved in this appeal.

IX. EVIDENCE APPENDIX

An Evidence Appendix containing copies of evidence relied upon in this appeal is attached.

X. RELATED PROCEEDINGS APPENDIX

A Related Proceedings Appendix is attached.

XI. CONCLUSION

For the foregoing reasons, reversal of the rejections of Claims 1-25 and 28-45 is respectfully requested.

Respectfully submitted,

Buchanan Ingersoll (including attorneys from Burns, Doane, Swecker & Mathis)

Date December 6, 2005 By: 

Edward A. Brown
Registration No. 35,033

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VIII. CLAIMS APPENDIX

The Appealed Claims

25. (Previously Presented) A gas injector for supplying process gas to a plasma processing chamber wherein a semiconductor substrate is subjected to plasma processing, the gas injector comprising:

gas injector body of dielectric material and sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber, wherein the gas outlets are located in the axial distal end surface of the gas injector body and the gas outlets are sized to inject the process gas at a subsonic, sonic or supersonic velocity.

28. (Previously Presented) The gas injector of Claim 25, the gas outlets include a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction.

29. (Previously Presented) The gas injector of Claim 25, wherein the gas injector includes a planar axial end face which is dimensioned so as to be flush with an interior surface of a dielectric window forming the chamber wall.

30. (Previously Presented) The gas injector of Claim 29, wherein the gas injector includes at least one seal adapted to contact the dielectric window when the gas injector is mounted in the dielectric window.

31. (Previously Presented) The gas injector of Claim 25, wherein the gas outlets include a plurality of angled gas outlets which inject process gas at an acute angle relative to a plane parallel to the distal end surface.

32. (Previously Presented) The gas injector of Claim 25, wherein the gas injector is adapted to be removably mounted in an opening in the chamber wall and includes at least one O-ring providing a vacuum seal between the gas injector and the chamber wall.

33. (Previously Presented) The gas injector of Claim 25, wherein the gas injector body includes a surface adapted to overlie an outer surface of the chamber wall.

34. (Previously Presented) The gas injector of Claim 25, wherein the gas injector body includes an annular flange adapted to overlie and contact an outer surface of the chamber wall.

35. (Previously Presented) The gas injector of Claim 25, wherein the gas injector body includes at least one O-ring seal on an outer surface of the gas injector body.

36. (Previously Presented) The gas injector of Claim 25, wherein the gas injector body includes a first O-ring seal on an outer surface of the gas injector body

and a second O-ring seal in a surface of a flange extending from the outer surface of the gas injector body.

37. (Previously Presented) The gas injector of Claim 25, wherein the distal end of the gas injector body is substantially planar.

38. (Previously Presented) The gas injector of Claim 25, wherein all of the gas outlets supply process gas through the distal end of the gas injector body.

39. (Previously Presented) A gas injector for supplying process gas to a plasma processing chamber wherein a semiconductor substrate is subjected to plasma processing, the gas injector comprising:

gas injector body sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber and a cylindrical bore adapted to supply gas to the gas outlets, the cylindrical bore being defined by a sidewall and an endwall which extends radially inwardly from the sidewall, the gas outlets including a center gas outlet extending from the endwall in the axial direction and a plurality of angled gas outlets extending from the endwall at an acute angle to the axial direction, wherein the gas outlets are located in the axial distal end surface of the gas injector body;

an annular flange adapted to overlie and contact an outer surface of the chamber wall; and

a first O-ring in a surface of the flange for sealing against the outer surface of the chamber wall.

40. (Previously Presented) The gas injector of Claim 39, comprising a second O-ring seal on an outer surface of the gas injector body.

41. (Previously Presented) A gas injector for supplying process gas to a plasma processing chamber wherein a semiconductor substrate is subjected to plasma processing, the gas injector comprising:

a gas injector body sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber, wherein the gas outlets are located in the axial distal end surface of the gas injector body and the gas outlets being sized to inject the process gas at a subsonic, sonic or supersonic velocity, wherein the gas injector body includes a uniform diameter central bore adapted to supply gas to the gas outlets, the central bore extending axially from an upper axial end face of the gas injector body, the central bore being defined by a cylindrical sidewall and a flat endwall extending between the cylindrical sidewall, inlets of the gas outlets being located on the flat endwall.

42. (Previously Presented) A gas injector for supplying process gas to a plasma processing chamber wherein a semiconductor substrate is subjected to plasma processing, the gas injector comprising:

gas injector body made of a dielectric material selected from the group consisting of quartz, alumina and silicon nitride and sized to extend through a chamber wall of the processing chamber such that an axial distal end surface of the gas injector body is exposed within the processing chamber, the gas injector body including a plurality of gas outlets adapted to supply process gas into the processing chamber, wherein the gas outlets are located in the axial distal end surface of the gas injector body and the gas outlets being sized to inject the process gas at a subsonic, sonic or supersonic velocity.

43. (Previously Presented) The gas injector of Claim 28, wherein the gas injector body includes 8 of the angled gas outlets.

44. (Previously Presented) The gas injector of Claim 28, wherein the acute angle is 10 to 70°.

45. (Previously Presented) The gas injector of Claim 28, wherein the angled gas outlets direct the process gas such that the process gas does not flow directly towards a substrate being processed.

IX. EVIDENCE APPENDIX

The following evidence is relied upon by Appellant in this appeal:

1.) Exhibit A filed on April 4, 2005.

2.) Copy of page 386 of American Heritage® College *dic.tion.ar.y*, Third Edition (2000), filed on April 4, 2004.

X. RELATED PROCEEDINGS APPENDIX

None.

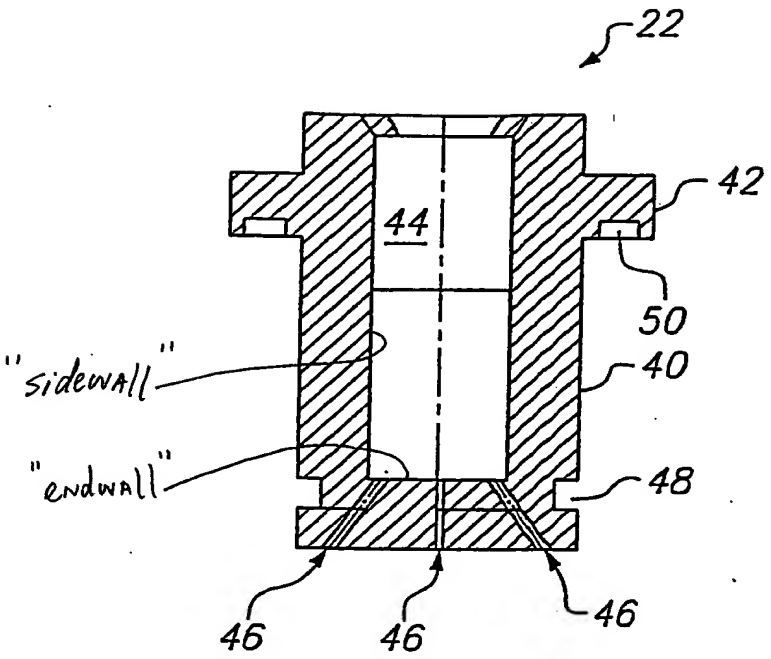

FIG. 3A

(PRESENT APPLICATION)

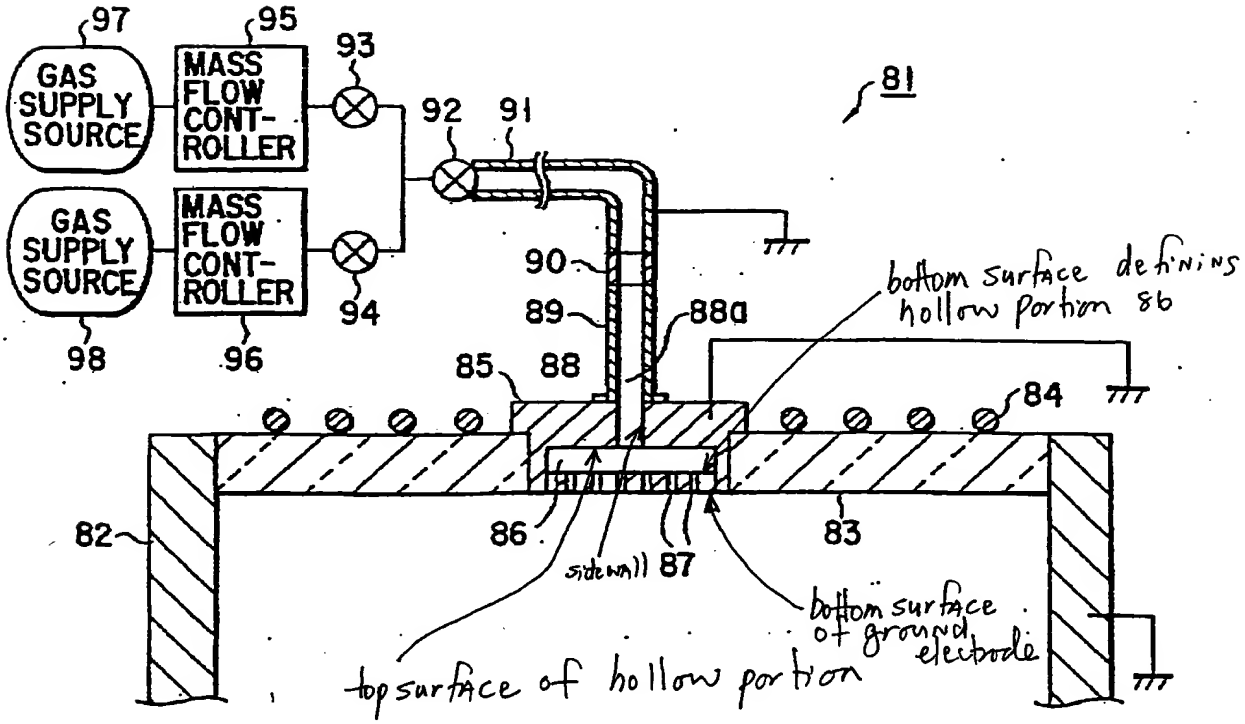

FIG. 4

(ISHII)

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Babe Didrikson

who wrote *Letters from a Farmer in Pennsylvania* (1767–68).

Dick test *n.* A skin test used to determine immunity or susceptibility to scarlet fever. [After George Frederick Dick and Gladys Henry Dick.]

dick·y[1] (dĭk′ē) *n.* Var. of **dickey**.

dick·y[2] (dĭk′ē) *adj. Informal.* Impaired; faulty; weak. [?]

di·cli·nous (dī-klī′nəs) *adj. Bot.* Having stamens and pistils in separate flowers. [DI-[1] + Gk. *klinē*, bed, couch; see **klei-*** + **-ous**.] — **di′cli′ny** (dī′klī′nē) *n.*

di·cot·y·le·don (dī′kŏt′l-ēd′n) also **di·cot** (dī′kŏt′) *n.* A flowering plant having two embryonic seed leaves or cotyledons that usu. appear at germination. — **di′cot′y·le′don·ous** *adj.*

di·cro·tism (dī′krə-tĭz′əm) *n.* A condition in which the pulse is felt as two beats per single heartbeat. [< Gk. *dikrotos*, double-beating : *di-*, two; see DI-[1] + *krotos*, rattling noise.] — **di·crot′ic** (-krŏt′ĭk) *adj.*

dict. *abbr.* **1.** Dictation. **2.** Dictionary.

Dic·ta·phone (dĭk′tə-fōn′). A trademark used for an apparatus that records and reproduces dictation for transcription.

dic·tate (dĭk′tāt′, dĭk-tāt′) *v.* **-tat·ed, -tat·ing, -tates.** — *tr.* **1.** To say or read aloud to be recorded or written by another. **2.a.** To prescribe with authority; impose. **b.** To control or command. — *intr.* **1.** To dictate material. **2.** To issue orders or commands. — *n.* (dĭk′tāt′). **1.** A directive; a command. **2.** A guiding principle. [Lat. *dictāre*, *dictāt-*, freq. of *dīcere*, to say. See **deik-***.]

Syns: *dictate, decree, impose, ordain, prescribe.* The central meaning shared by these verbs is "to set forth expressly and authoritatively": *victors dictating the terms of surrender; budget cuts decreed by the legislature; impose obedience; a separation ordained by fate; taxes prescribed by law.*

dic·ta·tion (dĭk-tā′shən) *n.* **1.a.** The act or process of dictating material to another for transcription. **b.** The material so dictated. **2.** An authoritative command or order.

dic·ta·tor (dĭk′tā′tər, dĭk-tā′-) *n.* **1.a.** An absolute ruler. **b.** A tyrant; a despot. **2.** An ancient Roman magistrate appointed temporarily to deal with an immediate crisis or emergency. **3.** One who dictates: *the dictator of the letter.*

dic·ta·to·ri·al (dĭk′tə-tôr′ē-əl, -tōr′-) *adj.* **1.** Tending to dictate; domineering. **2.** Of, relating to, or characteristic of a dictator or dictatorship; autocratic. — **dic′ta·to′ri·al·ly** *adv.* — **dic′ta·to′ri·al·ness** *n.*

dic·ta·tor·ship (dĭk′tā′tər-shĭp′, dĭk′tā′-) *n.* **1.** The office or tenure of a dictator. **2.** A state or government under dictatorial rule. **3.** Absolute or despotic control or power.

dic·tion (dĭk′shən) *n.* **1.** Choice and use of words in speech or writing. **2.** Distinctness of pronunciation in speech or singing. [ME *diccion*, a saying, word < OFr. < Lat. *dictiō*, *dictiōn-*, rhetorical delivery < *dictus*, p.part. of *dīcere*, to say. See **deik-***.] — **dic′tion·al** *adj.* — **dic′tion·al·ly** *adv.*

dic·tion·ar·y (dĭk′shə-nĕr′ē) *n.*, *pl.* **-ies. 1.** A reference book containing an alphabetical list of words, with information given for each word, usu. including meaning, pronunciation, and etymology. **2.** A book listing the words of a language with translations into another language. **3.** A book listing words or other linguistic items in a particular category or subject with information about them: *a medical dictionary.* **4.** *Comp. Sci.* A list of words stored in machine-readable form for reference, as by spelling-checking software. [Med.Lat. *dictiōnārium* < Lat. *dictiō*, *dictiōn-*, diction. See DICTION.]

dic·tum (dĭk′təm) *n.*, *pl.* **-ta** (-tə) or **-tums. 1.** An authoritative, often formal pronouncement. **2.** *Law.* See **obiter dictum**. **1.** [Lat. < neut. p.part. of *dīcere*, to say. See **deik-***.]

dic·ty·o·some (dĭk′tē-ə-sōm′) *n.* *Bot.* The Golgi apparatus in plant cells. [Gk. *diktuon*, net (< *dikein*, to throw; see **deik-***) + **-some**[3].]

did (dĭd) *v.* P.t. of **do**[1].

di·dact (dī′dăkt′) *n.* A didactic person. [Back-formation < DIDACTIC.]

di·dac·tic (dī-dăk′tĭk) also **di·dac·ti·cal** (-tĭ-kəl) *adj.* **1.** Intended to instruct. **2.** Morally instructive. **3.** Inclined to teach or moralize excessively. [Gk. *didaktikos*, skillful in teaching < *didaktos*, taught < *didaskein*, *didak-*, to teach, educate.] — **di·dac′ti·cal·ly** *adv.* — **di·dac′ti·cism** (-tĭ-sĭz′əm) *n.*

di·dac·tics (dī-dăk′tĭks) *n.* *(used with a sing. or pl. v.)* Instruction; teaching; pedagogy.

di·dap·per (dī′dăp′ər) *n.* A small grebe, such as the dabchick. [ME *didopper*, alteration of *divedap* : < OE *dūfedoppa*, pelican : *dūfan*, to dive; see DIVE[1] + *-doppa*, a kind of bird.]

did·dle[1] (dĭd′l) *v.* **-dled, -dling, -dles.** *tr.v.* **1.** *Slang.* To cheat; swindle. **2.** *Comp. Sci.* To fabricate, change, or otherwise manipulate (data) illegally. [Perh. akin to OE *dydrian*, to deceive, or < var. of dial. *doodle*, fool, simpleton; akin to LGer. *dudeldopp*.] — **did′dler** *n.*

did·dle[2] (dĭd′l) *v.* **-dled, -dling, -dles.** — *tr.* **1.** To jerk up and down or back and forth. **2.** *Vulgar Slang.* **a.** To have intercourse with (a woman). **b.** To practice masturbation upon. — *intr.* **1.** To shake rapidly; jiggle. **2.** *Slang.* To play; fiddle. **3.** *Slang.* To waste time: *diddled around all morning.* [Prob. alteration of dial. *didder*, to quiver, tremble < ME *dideren*, var. of *daderen*, *doderen*, perh. < LGer.]

did·dly (dĭd′lē) *n.* *Slang.* A small or worthless amount. [Short for *diddlyshit*. See DIDDLYSQUAT.]

did·dly·squat (dĭd′lē-skwŏt′) *n.* *Slang.* Diddly. [Alteration of *diddlyshit* : *diddly* (alteration of DOODLE) + SHIT.]

Di·de·rot (dē′də-rō′, dē-drō′), **Denis.** 1713–84. French philosopher and writer whose supreme accomplishment was his work on the *Encyclopédie* (1751–72).

did·n't (dĭd′nt). Did not.

di·do (dī′dō) *n.*, *pl.* **-dos** or **-does.** A mischievous prank or antic; a caper. [?]

Di·do (dī′dō) *n.* *Rom. Myth.* The founder and queen of Carthage, who fell in love with Aeneas and killed herself when he abandoned her.

Did·rik·son (dĭd′rik-sən), **Mildred Ella ("Babe").** Married name Zaharias. 1914–56. Amer. athlete who excelled in golf and track and won two gold medals at the 1932 Olympics.

didst (dĭdst) *v.* *Archaic.* Second pers. sing. p.t. of **do**[1].

di·dym·i·um (dī-dĭm′ē-əm) *n.* **1.** *Symbol* **Di** A metallic mixture, once considered an element, composed of neodymium and praseodymium. **2.** A mixture of rare-earth elements and oxides used chiefly in manufacturing and coloring various forms of glass. [< Gk. *didumos*, twin, double. See **dwo-***.]

did·y·mous (dĭd′ə-məs) *adj.* Arranged or occurring in pairs; twin. [< Gk. *didumos*, twin. See **dwo-***.]

di·dyn·a·mous (dī-dĭn′ə-məs) *adj.* *Bot.* Having four stamens in two pairs of unequal length. [< NLat. *Didynamia*, former class name : DI-[1] + Gk. *dunamis*, power; see DYNAMIC.]

die[1] (dī) *intr.v.* **died, dy·ing** (dī′ĭng), **dies. 1.** To cease living; become dead; expire. **2.** To cease existing, esp. by degrees; fade. **3.** To experience an agony or suffering suggestive of that of death. **4.** *Informal.* To desire something greatly. **5.a.** To cease operation; stop. **b.** To be destroyed, as in combat. — *phrasal verbs.* **die back.** *Bot.* To be affected by dieback. **die down.** To lose strength; subside. **die off.** To undergo a sudden sharp decline in population. **die out.** To cease living completely; become extinct. — *idiom.* **die hard.** To take a long time in passing out of existence. [ME *dien*, prob. < ON *deyja*. See **dheu-**[2]*.]

die[2] (dī) *n.*, *pl.* **dies** or **dice** (dīs). **1.** *pl.* **dies.** A device used for cutting out, forming, or stamping material, esp.: **a.** An engraved metal piece used for impressing a design onto a softer metal, as in coining money. **b.** One of several component pieces that are fitted into a diestock to cut threads on screws or bolts. **c.** A part on a machine that punches shaped holes in, cuts, or forms sheet metal, cardboard, or other stock. **d.** A metal block containing small conical holes through which plastic, metal, or other ductile material is extruded or drawn. **2.** *pl.* **dies.** *Archit.* The dado of a pedestal, esp. when cube-shaped. **3.** *pl.* **dice.** *Games.* **a.** A small cube marked on each side with from one to six dots, usu. used in pairs in gambling and in various other games. **b.** **dice.** *(used with a sing. v.)* A game of chance using dice. — *tr.v.* **died, die·ing, dies.** To cut, form, or stamp with or as if with a die. — *idioms.* **load the dice. 1.** To make an outcome highly probable; predetermine a result. **2.** To put another at a distinct disadvantage, as through prior maneuver. **the die is cast.** The decision has been made and is irrevocable. [ME *de*, gaming die < OFr. < Lat. *datum* < neut. p.part. of *dare*, to give. See **dō-***.]

die-back (dī′băk′) *n.* *Bot.* The gradual dying of plant shoots, starting at the tips, caused by disease or climate.

di·e·cious (dī-ē′shəs) *adj.* *Bot.* Var. of **dioecious**.

Die·fen·ba·ker (dē′fən-bā′kər), **John George.** 1895–1979. Canadian politician who served as prime minister (1957–63).

dief·fen·bach·i·a (dē′fən-bā′kē-ə, -bāk′ē-ə) *n.* Any of several plants of the genus *Dieffenbachia* native to tropical America and having jointed stems and variegated leaves. [NLat., genus name, after Ernst *Dieffenbach* (1811–55), German naturalist.]

die-hard also **die·hard** (dī′härd′) — *adj.* Stubbornly resisting change or clinging to a seemingly hopeless or dated cause. — *n.* A diehard person. — **die′-hard′ism** *n.*

diel·drin (dēl′drĭn) *n.* A chlorinated hydrocarbon, $C_{12}H_8Cl_6O$, used as an insecticide and in mothproofing. [< *Diel(s-A)ld(e)r (reaction)*, after Otto Paul Hermann Diels and Kurt Alder.]

di·e·lec·tric (dī′ĭ-lĕk′trĭk) *n.* A nonconductor of electricity, esp. a substance with electrical conductivity less than a millionth (10^{-6}) of a siemens. [DI(A)- + ELECTRIC.] — **di′e·lec′tric** *adj.* — **di′e·lec′tri·cal·ly** *adv.*

dielectric constant *n.* *Phys.* See **permittivity**.

dielectric heating *n.* The heating of electrically nonconducting materials by a rapidly varying electromagnetic field.

Diels (dēls), **Otto Paul Hermann.** 1876–1954. German chemist who shared a 1950 Nobel Prize.

Di·em (dē-ĕm′, dyĕm), **Ngo Dinh.** 1901–63. Vietnamese politician who was president of South Vietnam (1954–63).

Dien Bien Phu (dyĕn′ byĕn′ fōō′). A town of NW Vietnam near the Laos border; site of a French military base that fell to Vietminh troops on May 7, 1954, after a 56-day siege.

di·en·ceph·a·lon (dī′ĕn-sĕf′ə-lŏn′, -lən) *n.* The posterior part of the forebrain that connects the mesencephalon with the cerebral hemispheres, encloses the third ventricle, and contains the thalamus and hypoth

— **di·en·ce·phal′ic** (-sə-făl′ĭ

die-off (dī′ôf′, -ŏf′) *n.* The eli
tion, or community of plants c
causes.

Di·eppe (dē-ĕp′, dyĕp). A city
Channel N of Rouen; site of
raid (Aug. 19, 1942). Pop. 35

di·er·e·sis or **di·aer·e·sis** (
1. *Ling.* a. A mark (¨) placed
vowels to indicate that they ar
sounds rather than a diphthor
placed over a vowel, such as
indicate that the vowel is no
pause in a line of verse when
of a metric foot coincide. [LL
diairein, to divide : *dia-*, apar

die·sel (dē′zəl, -səl) *n.* **1.** A die
by a diesel engine.

Die·sel (dē′zəl), **Rudolf.** 1858
devised and patented (1892)

diesel engine *n.* An internal-c
heat of highly compressed air
duced after the compression
EL.]

die·sink·er (dī′sĭng′kər) *n.* O
dies for stamping or shaping.

Di·es I·rae (dē′ās ĭr′ā′) *n.* A
Judgment Day, used in some
Diēs īrae, day of wrath (the
diēs, day + Lat. *īrae*, genitiv

di·e·sis (dī′ĭ-sĭs) *n.*, *pl.* **-ses** (-
[Med.Lat., semitone (shown
quarter tone < Gk. *diesis*, let
through : *dia-*, dia- + *hienai*

die-stock (dī′stŏk′) *n.* An app
cut threads on screws, bolts,

di·es·trus (dī-ĕs′trəs) also **di·**
inactive period of the estrous
es′trous *adj.*

di·et[1] (dī′ĭt) *n.* **1.** The usual
animal. **2.** A regulated select
prescribed. **3.** Something used
a diet of detective novels. —
To eat and drink according t
to lose weight or control a
ulate or prescribe food and
Lat. *diaeta*, way of living, di

di·et[2] (dī′ĭt) *n.* **1.** A national
certain countries, such as Jap
of the princes or estates of
diete, day's journey, day for
dīēta, alteration (influenced
Lat. *diaeta*, daily routine. Se

di·e·tar·y (dī′ĭ-tĕr′ē) *adj.* Of
1. A system or regimen of d
allowance. — **di′e·tar′i·ly** (
dietary law *n.* *Judaism.* The bo
kinds and combinations of f

di·e·tet·ic (dī′ĭ-tĕt′ĭk) *adj.*
regulation. **2.** Specially prep
diets. [Lat. *diaetēticus* < G
DIET[1].] — **di′e·tet′i·cal·ly** *
di·e·tet·ics (dī′ĭ-tĕt′ĭks) *n.* (
nutrition as it relates to heal

di·eth·yl·car·bam·a·zine
zēn′) *n.* An anthelmintic agen
treatment of ascariasis and
BAM(IC ACID) + (PIPER)AZINE.]

di·eth·yl ether (dī-ĕth′əl) *n.*

di·eth·yl·stil·bes·trol (dī-ĕ
n. DES.

diethyl tol·u·am·ide (tŏl′yə
ETHYL + TOLU(ENE) + AMIDE.]

di·e·ti·tian or **di·e·ti·cian** (
izing in dietetics. [DIET[1] + -

Die·trich (dē′trĭk, -trĭkH), M
Amer. actress and singer wh
(1930) and *Destry Rides Ag*

dif. *abbr.* Difference.

diff. *abbr.* Difference.

dif·fer (dĭf′ər) *intr.v.* **-fered,**
or unlike in nature, quality,
different opinion; disagree.
[ME *differren* < OFr. *differe*
dis-, apart; see DIS- + *fer*

dif·fer·ence (dĭf′ər-əns, dĭf′
tion of being unlike or dissim
or unlikeness. **b.** A degree o
c. A specific point distingu
3. A noticeable change or ef
troversy. **b.** A cause of a dis